The Health Concerns Related to Air Quality in Washington County

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SouthWest Utah Public Health Department

SW Utah Public Health Department

- 5 counties
- 225,000 population
- 128 programs
- Environmental Health
- Not the regulating agency for Air quality

Air Quality and Health

- Diseases
- Pollutants

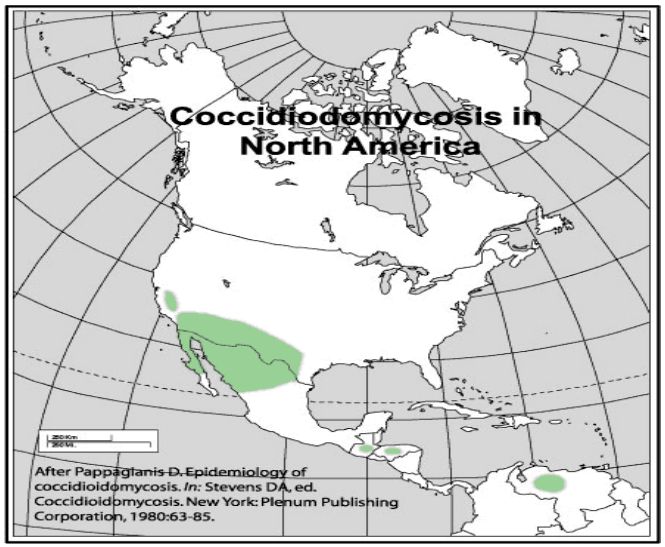
Introduction to *Coccidioides immitis*

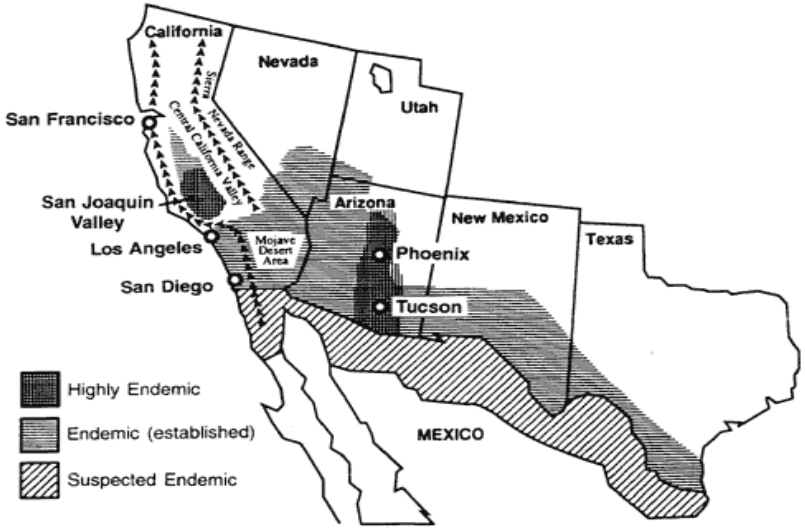
C. immitis is a pathogenic fungus that can be found in two different forms during the life cycle.

1. As a mold 4 to 12 inches below the surface of the soil.

2. As a yeast after inhaled into the lungs of certain mammals.

Unique to a Small Area





- In areas where there is a lot of *C. immitis* in the environment the area is considered endemic.

- Endemic areas in the United States include southern Arizona, central California, southern New Mexico, west Texas and southern Utah.

Environmental Risk Factors

- Living in or traveling through an endemic area can lead to exposure and illness.
- People retiring and moving into endemic areas can be at risk of infection due to decreased immune system functions associated with age.
- *C immitis* outbreaks can occur following dust storms, earthquakes and soil excavation.

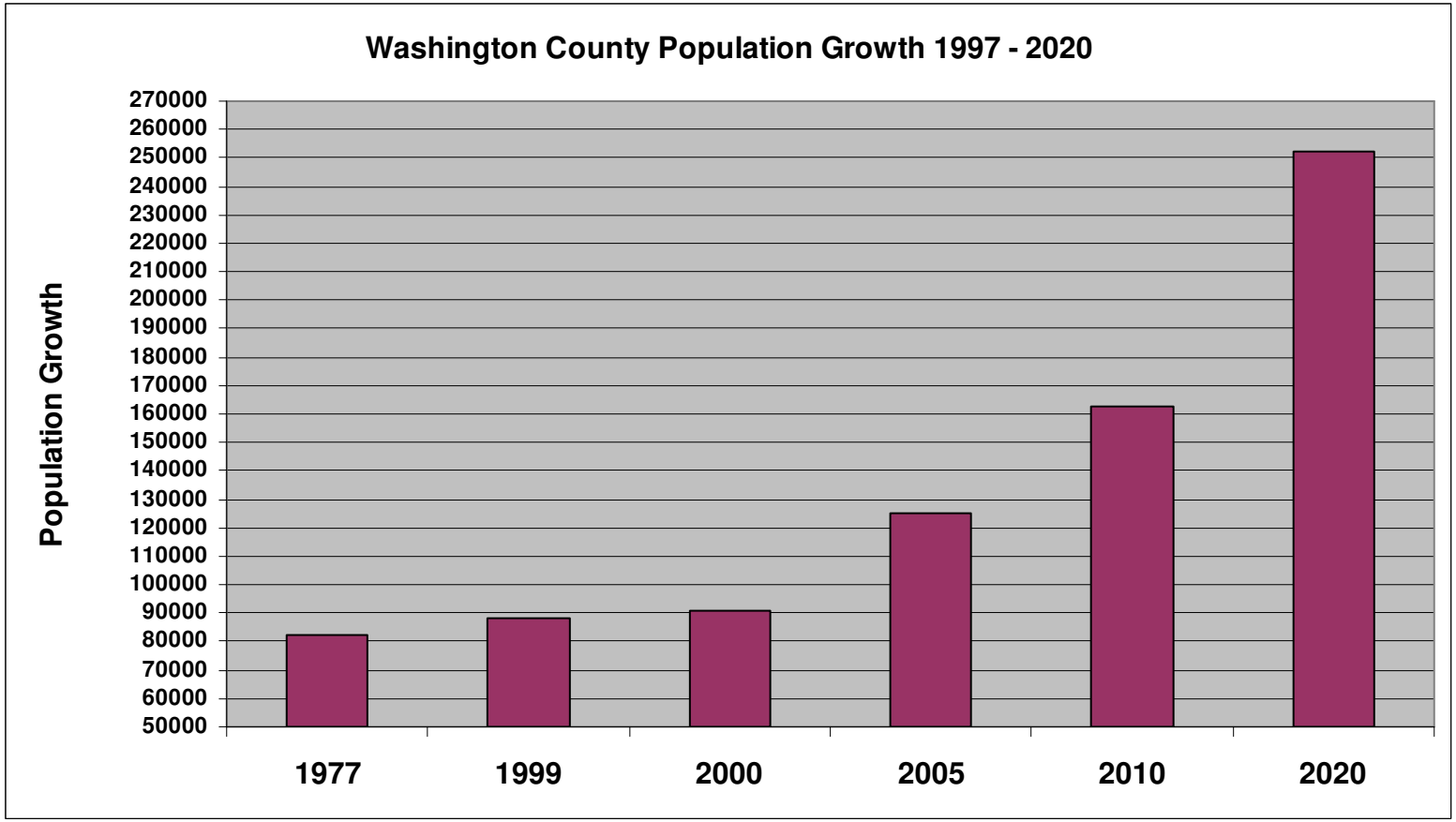
Cocci growth requirements

- Alkaline Soil
- Lower Elevation
- Rainfall 5-15 inches
- Mild Winters, Hot Summers

Coccidioidomycosis illness and complications

- Sixty percent of cases do not have symptoms, and most acquire life-long immunity.
- Thirty percent of cases involve mild to moderate complications.
- Five to ten percent of cases result in lung disease, and significant complications.
- A smaller percentage of cases result in chronic illness, and fatal complications.

Washington County Population Growth

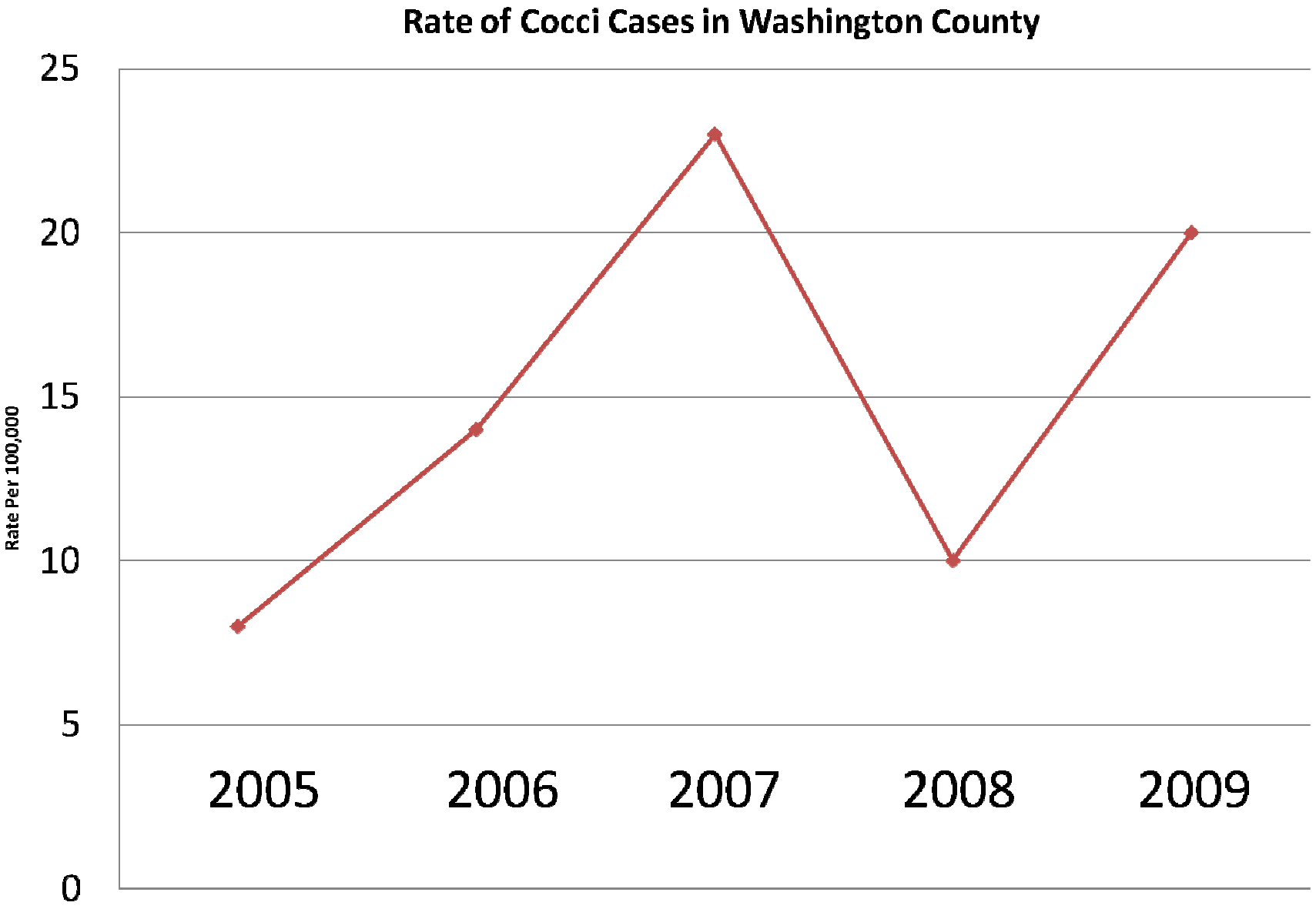


Cocci in Animals

- Known to cause disease and even death in
- Cats
- Dogs
- Cattle
- Horses
- Pigs and ruminants

Coccidioidomycosis Prevention

- Avoid endemic areas and dust in an endemic area
- Decrease the amount of dust in environment:
    - Install air conditioning
    - Pour concrete
    - Plant grass
    - Water down construction sites
- Educate people on risk factors
- Seek medical attention early


Rate of Cocci Cases in Washington County
Rate Per 100,000
25
20
15
10
5
0
2005
2006
2007
2008
2009

Air Quality and Health

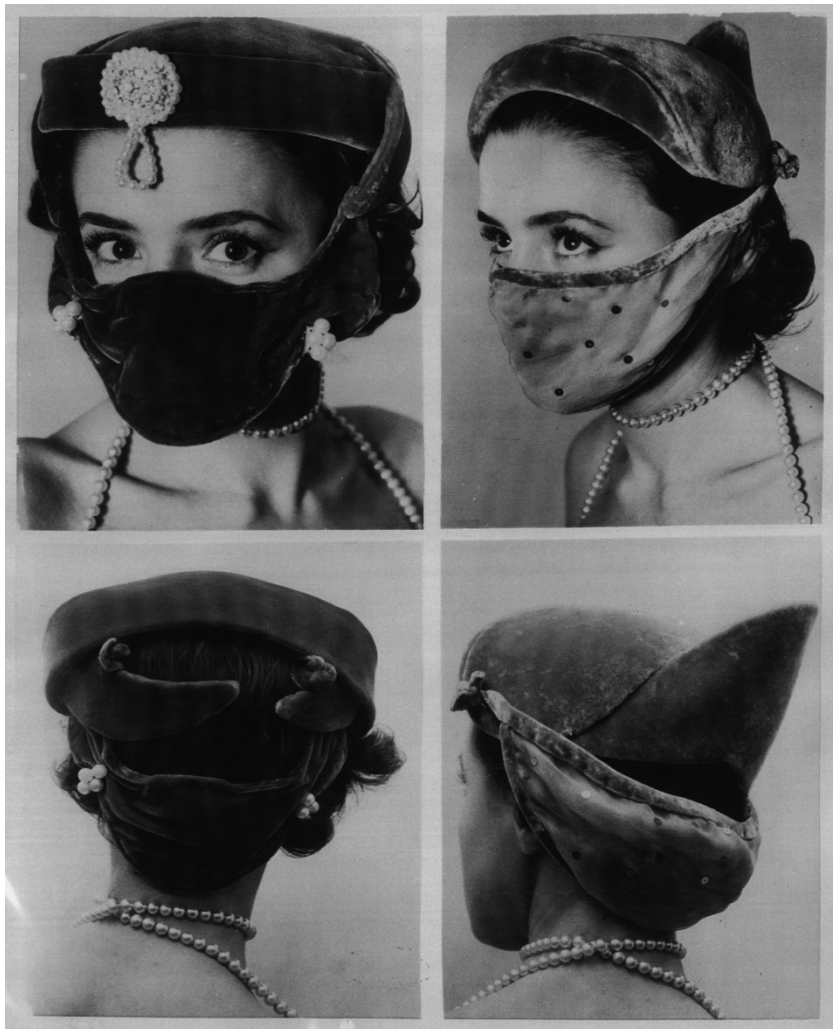
- Diseases
- Pollutants

Daytime in London, 1952

Particulate levels – 3,000 µg/m^3

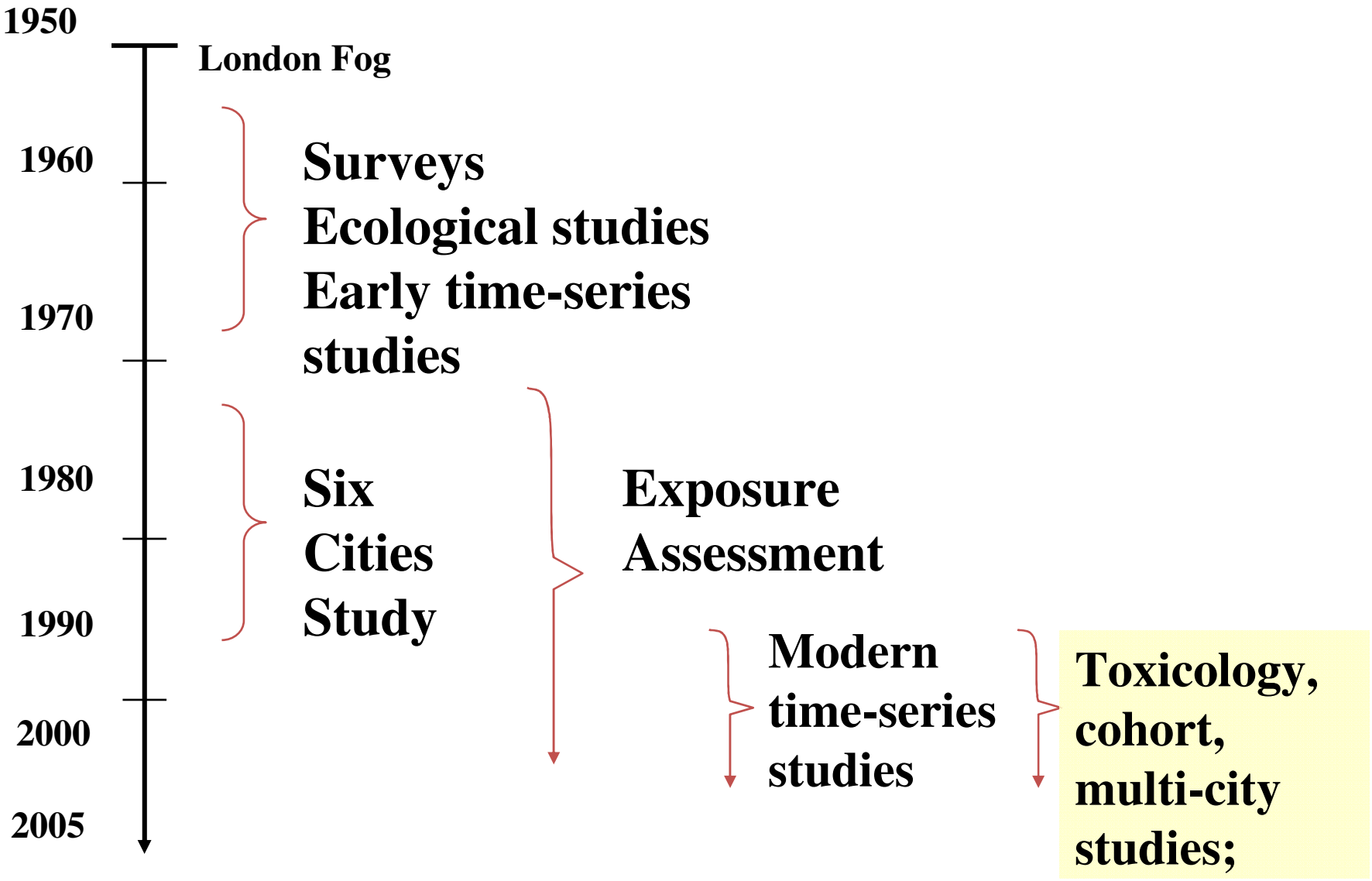
Source: National Archives

Designer Smog Masks - London 1950's



Source: DL Davis. *When Smoke Ran Like Water* (2002)

50+ Years of Air Pollution Research



- NAAQS have been established for:

  Photochemical Oxidants, currently indexed by ozone (O_3) for 8 hr daily max.

- Nitrogen Oxides (NO_x), indexed by nitrogen dioxide (NO_2) for ann

NAAQS have been established for:

Photochemical Oxidants, currently indexed by ozone (O_3) for 8 hr daily max.

Nitrogen Oxides (NO_x), indexed by nitrogen dioxide (NO_2) for annual av.

Sulfur Oxides (SO_x), indexed by sulfur dioxide (SO_2) for 24 hr daily max. and annual av.

Lead (Pb, all forms) - for 3 month av.

Particulate Matter (PM), for 24 hr daily max. and annual av. currently indexed by:

$PM_{2.5}$

PM_{10}

- NAAQS have been established for:
- Health Effects Basis for NAAQS (Major Influence):
  Premature Mortality (PM, and possibly for SO_x)

  Hospital Admissions (O_3, PM)

  Angina (CO)

  Immune System Dysfunction (NO_2)

  Neurobehavioral Deficits (Pb)

  Increased Blood Pressure (Pb)

- Widespread NAAQS Exceedances for:

  O_3

  $PM_{2.5}$

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Washington County Current 1-Hour Conditions

Wednesday September 8, 10:00 AM

Ozone

.120

.080

0

Web cam courtesy of the National Weather Service

PM2.5	Ozone
*NA µg/m^3	*NA ppm

Temperature	Wind
*NA° F	*NA *NA mph

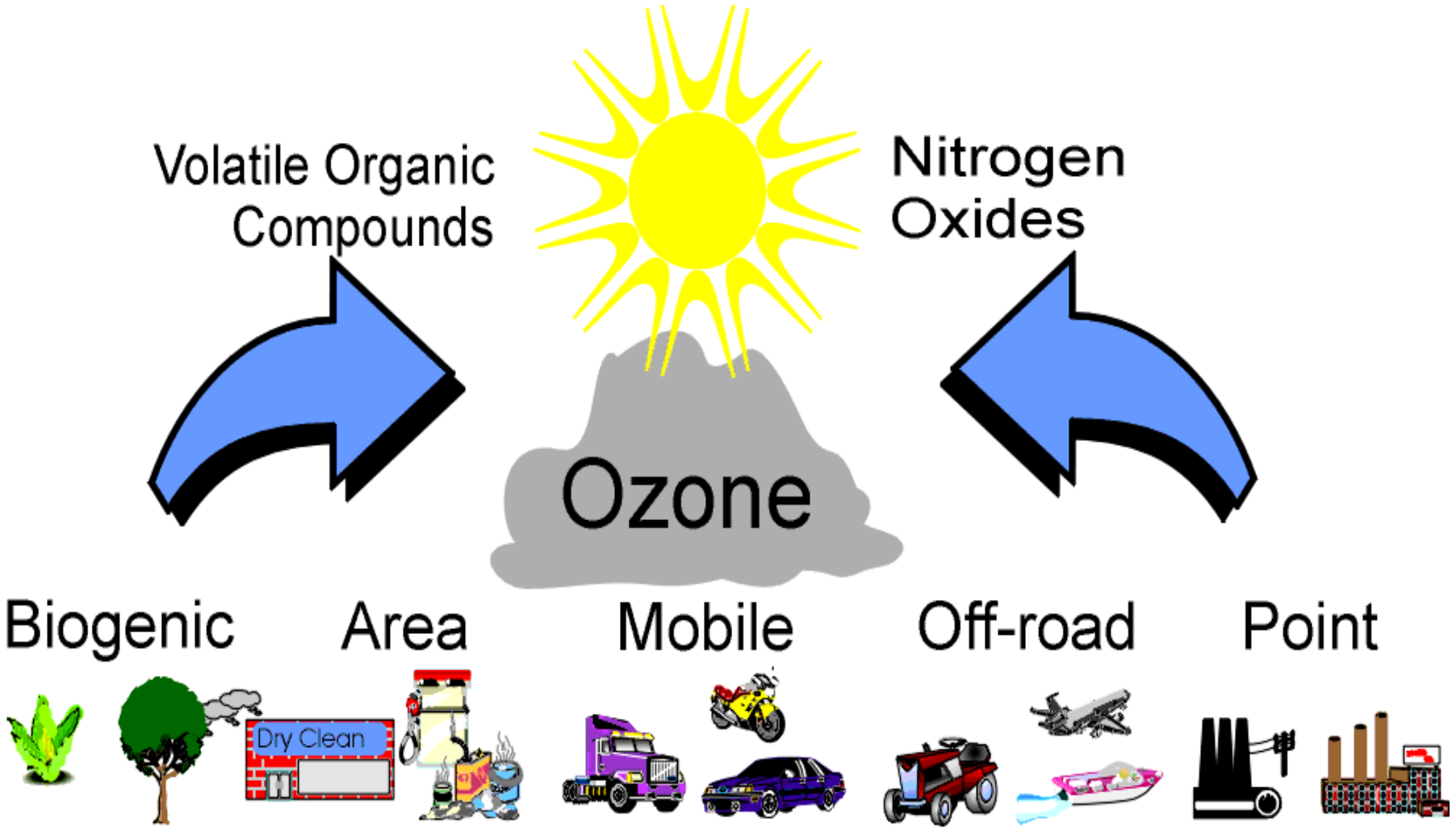
As with temperature, air pollution varies throughout the day.

*NA-No current data available.

A blowing dust advisory is in effect. Try to avoid outdoor activity if blowing dust is observed.

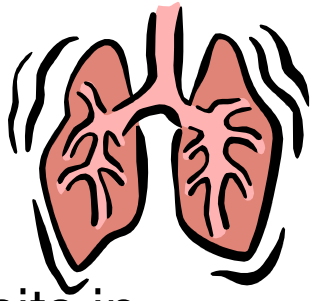
Forecast | Trend Charts

Done | Internet | 100%


Volatile Organic Compounds
Nitrogen Oxides
Ozone
Biogenic
Area
Mobile
Off-road
Point
Dry Clean

Why is Ozone Bad to Breathe?

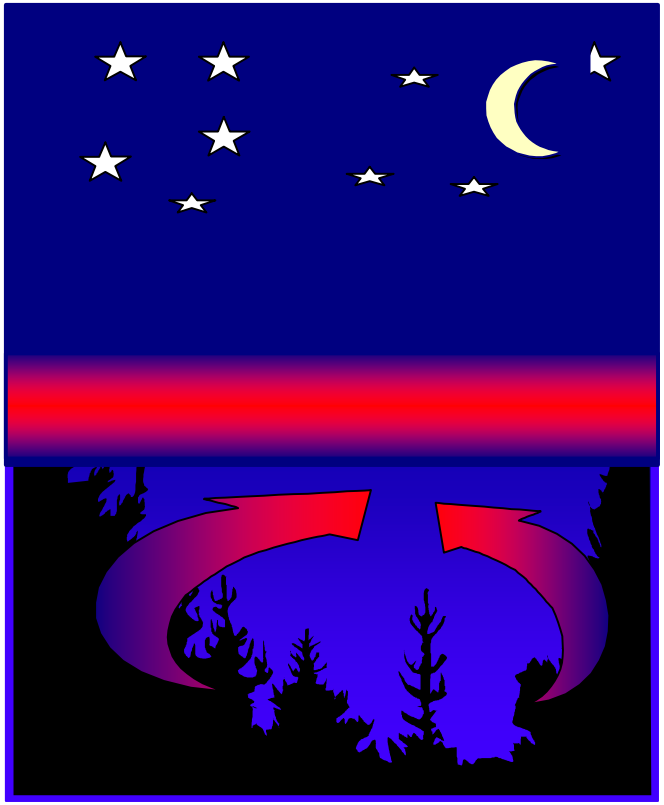
- Ozone can irritate lungs and airways, and cause inflammation much like a sunburn on your lungs.



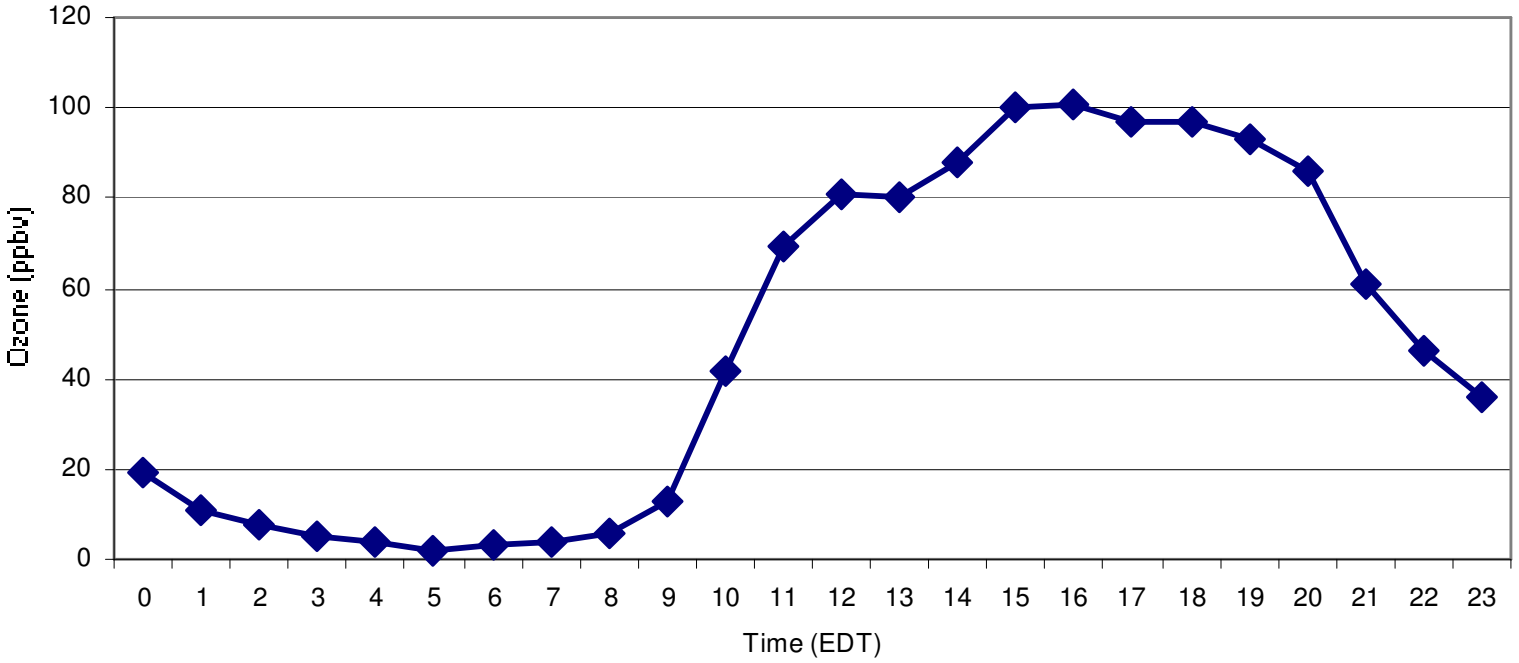
- Ozone can aggravate respiratory illnesses like asthma.
- 10 to 20% of summertime respiratory-related hospital visits in the Northeast are associated with ozone pollution.
- Children and people with chronic lung diseases are particularly at risk.

Ozone from other parts

- At night the earth cools and a “nocturnal inversion” is created several hundred meters above the surface
- Ozone, created earlier in the day is trapped above the inversion and moved to the north by night-time jets.
- Ozone below the inversion drops to very low levels.



Hourly Ground Level Ozone Graph for a Summer Day



How Much Ozone May be in the Low Level Jet?

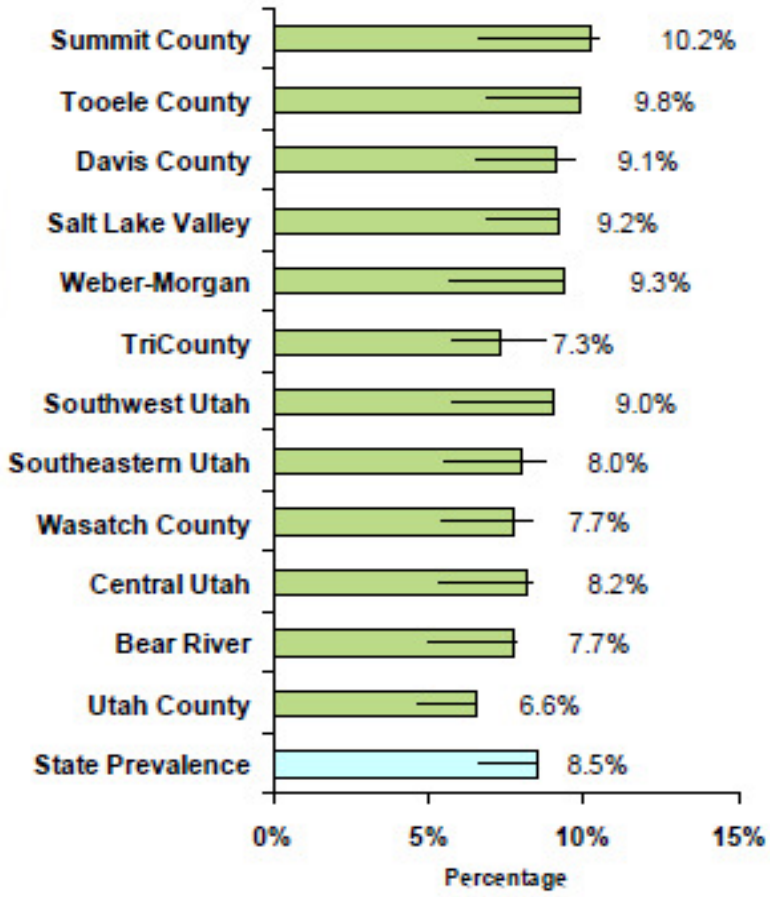
- The low level jet can routinely carry 80 to 90 ppb ozone.

Asthma in SW Utah

- Adults with Asthma: 7.89 %
  - In the State: 8.45%

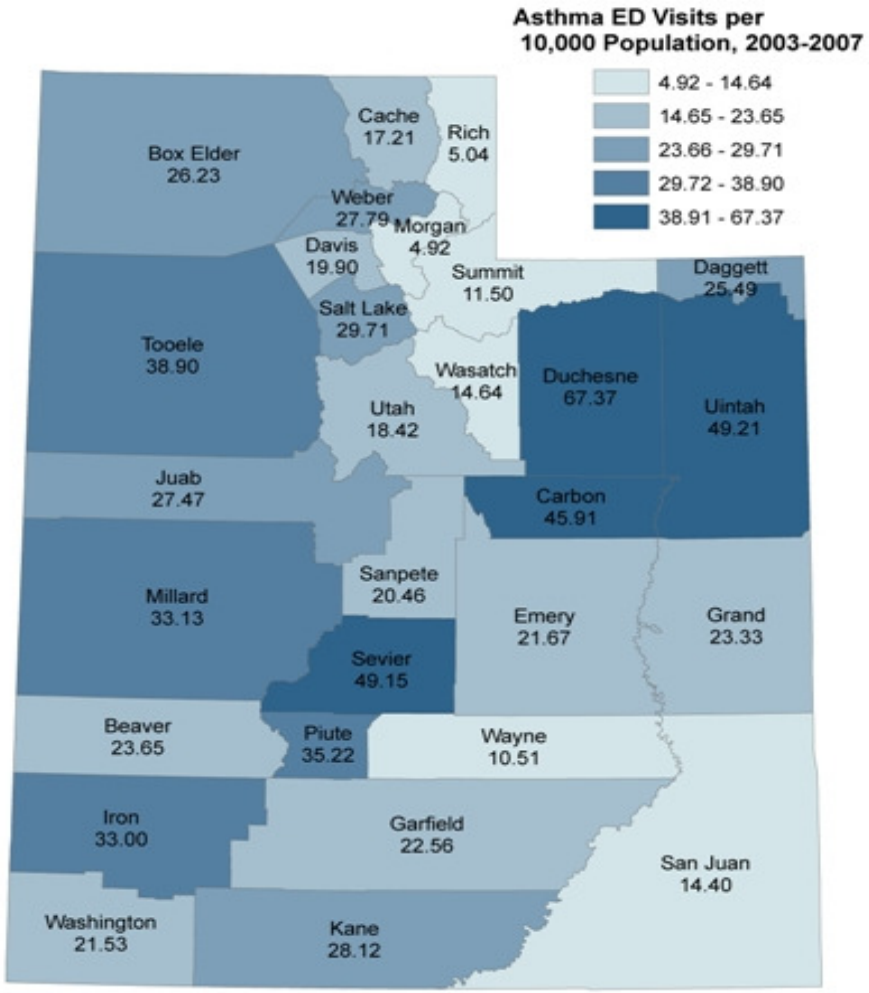
Children With Asthma

Figure 2. Prevalence of Current Asthma (0-17 Years of Age) by Local Health District, Utah, 2003, 2004, 2005, and 2006 Combined

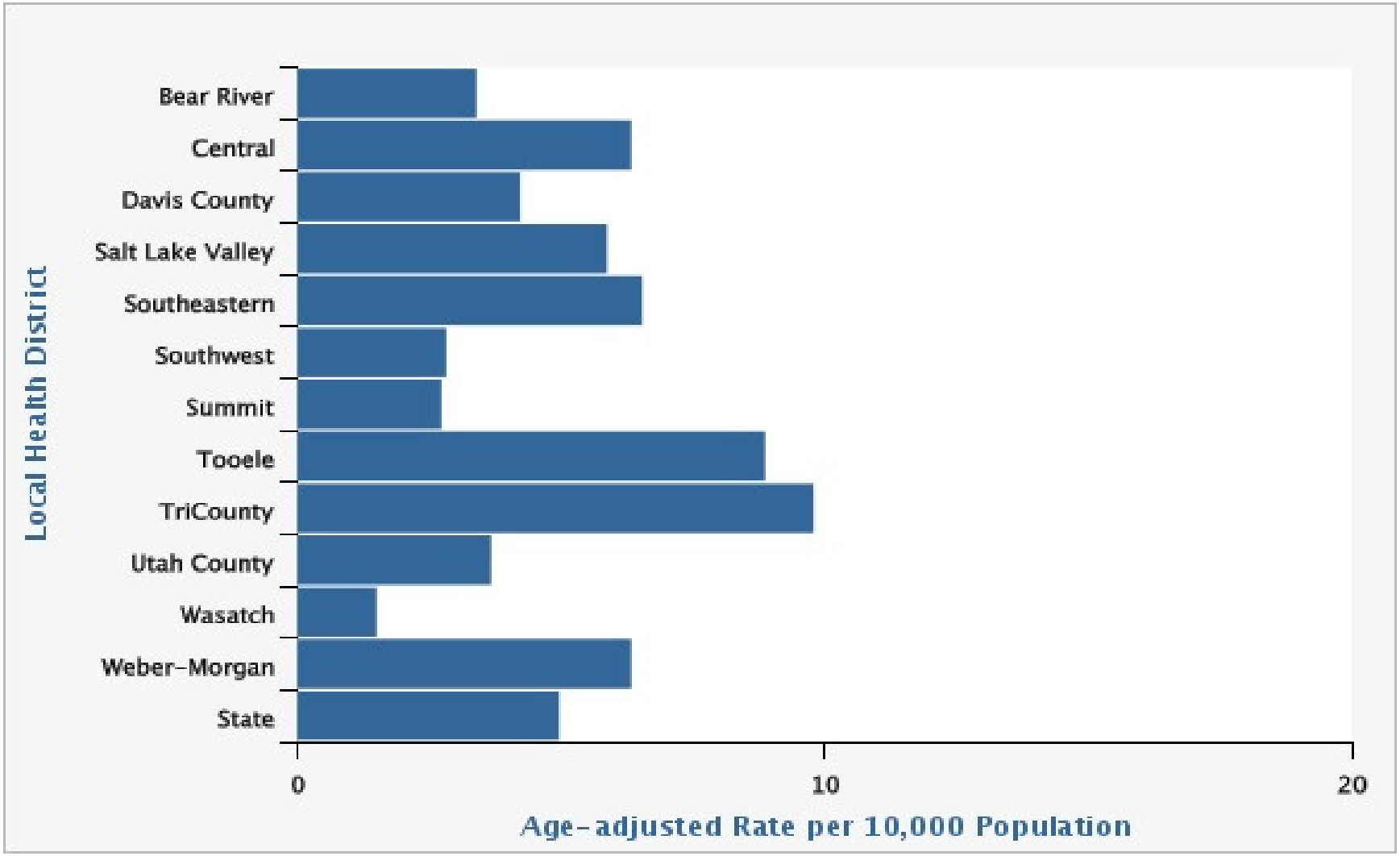


Note: Answer to the question, "Are you (Is he/she) currently under medical care for asthma?"Source: Utah Health Status Survey 2003, 2004, 2005, and 2006 combined.

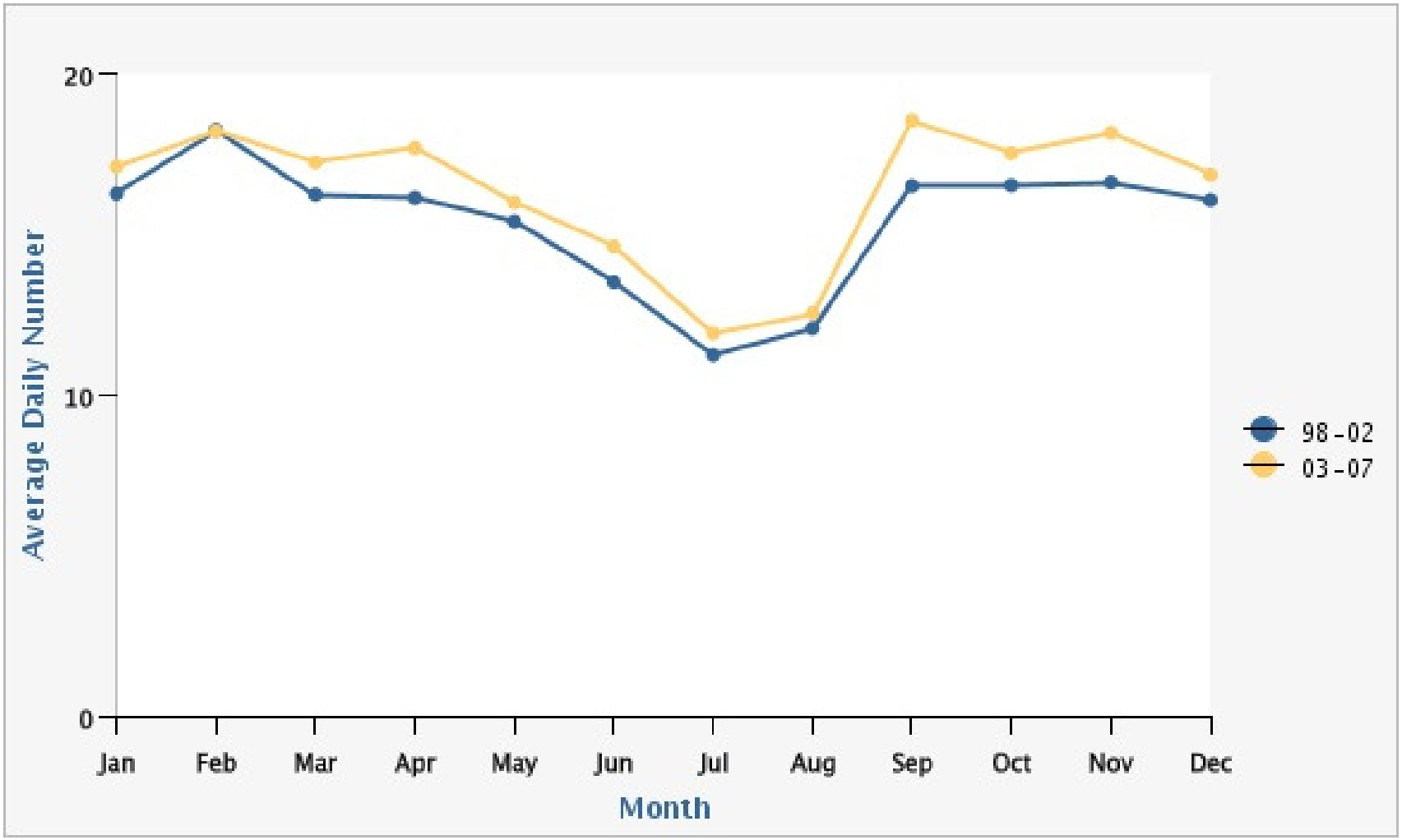
ED Visits for Asthma



Hospitalizations due to Asthma



Emergency Department Visits due to Asthma by Month, Utah, 1998-2007



What is Particulate Matter?

- particles of different substances suspended in the air
- in the form of solid particles and liquid droplets
- particles vary widely in size

Where does Pm come from?

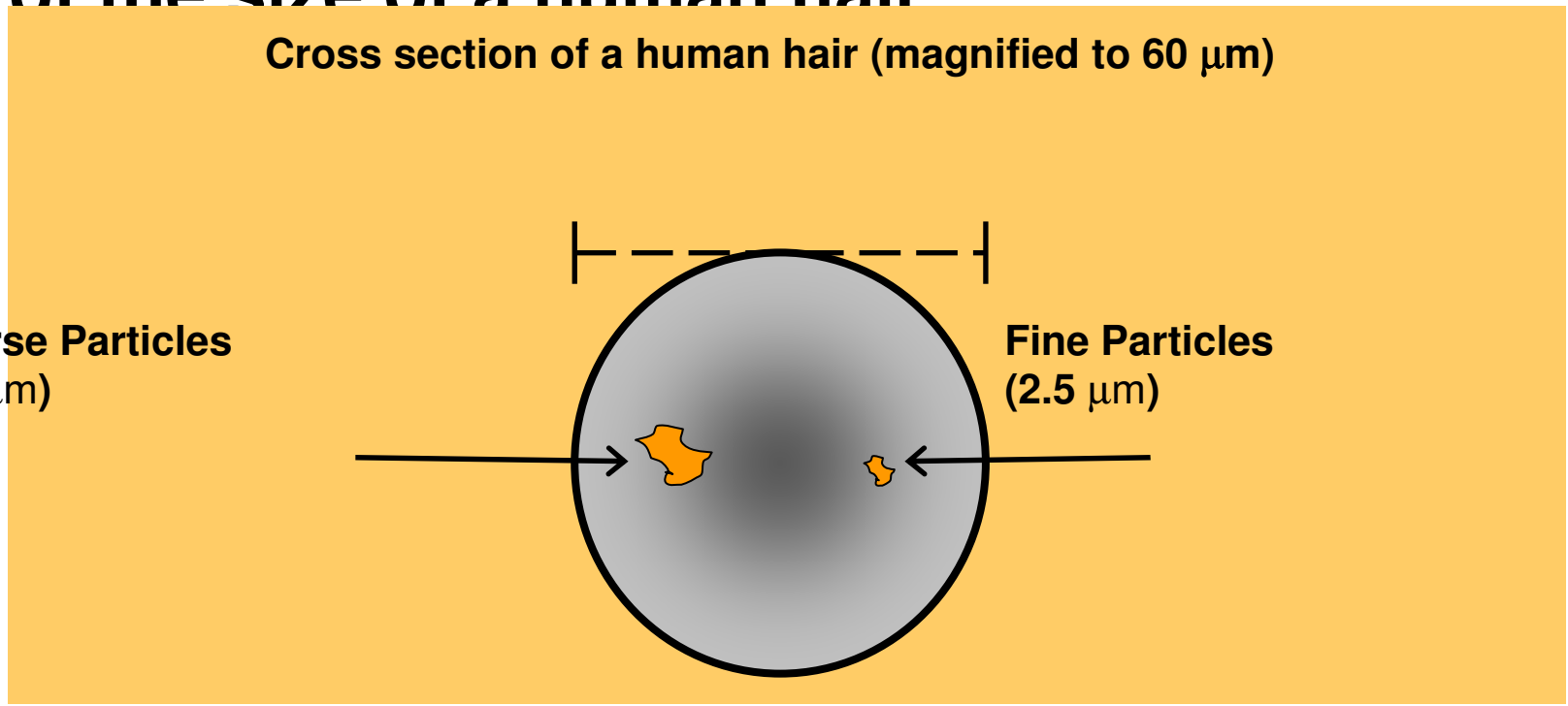
Fine particles come from a variety of sources:

- diesel trucks and buses
- construction equipment
- power plants
- woodstoves
- Wildfires
- Dust

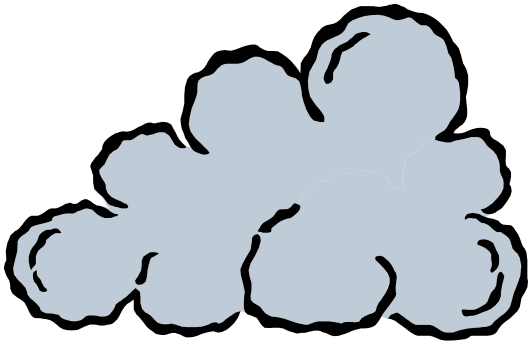
Also, Chemical reactions in the atmosphere can transform gases into fine particles.

How Fine is Fine?

- **Fine particles are only a fraction of the size of a human hair**



Why are Fine Particles Bad to Breathe?



- Fine particles easily reach the deepest parts of the lungs.
- Particulate matter causes 10,000 premature deaths every year in the US.
- Fine particles from Diesel exhaust can cause lung cancer.

Health Effects of Exposure to Fine Particles

- Premature death
- Aggravated asthma
- Respiratory-related emergency room visits and hospital admissions

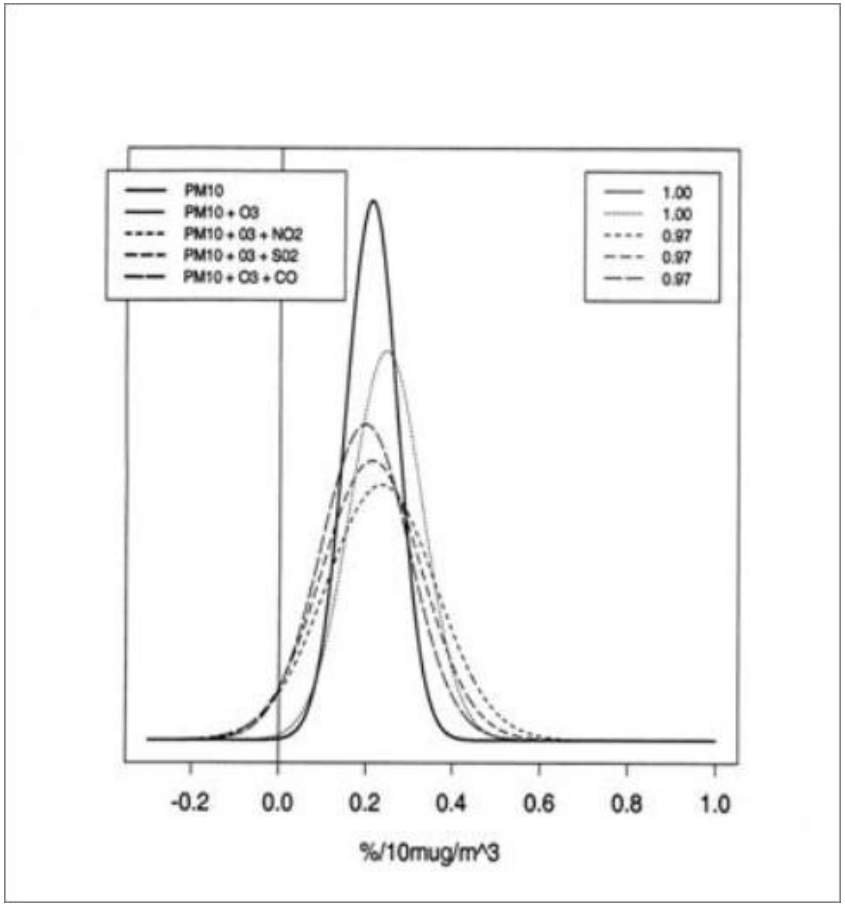
- Acute respiratory symptoms
- Chronic bronchitis
- Decreased lung function (shortness of breath)
- People with existing heart and lung disease, as well as the elderly and children, are particularly at risk

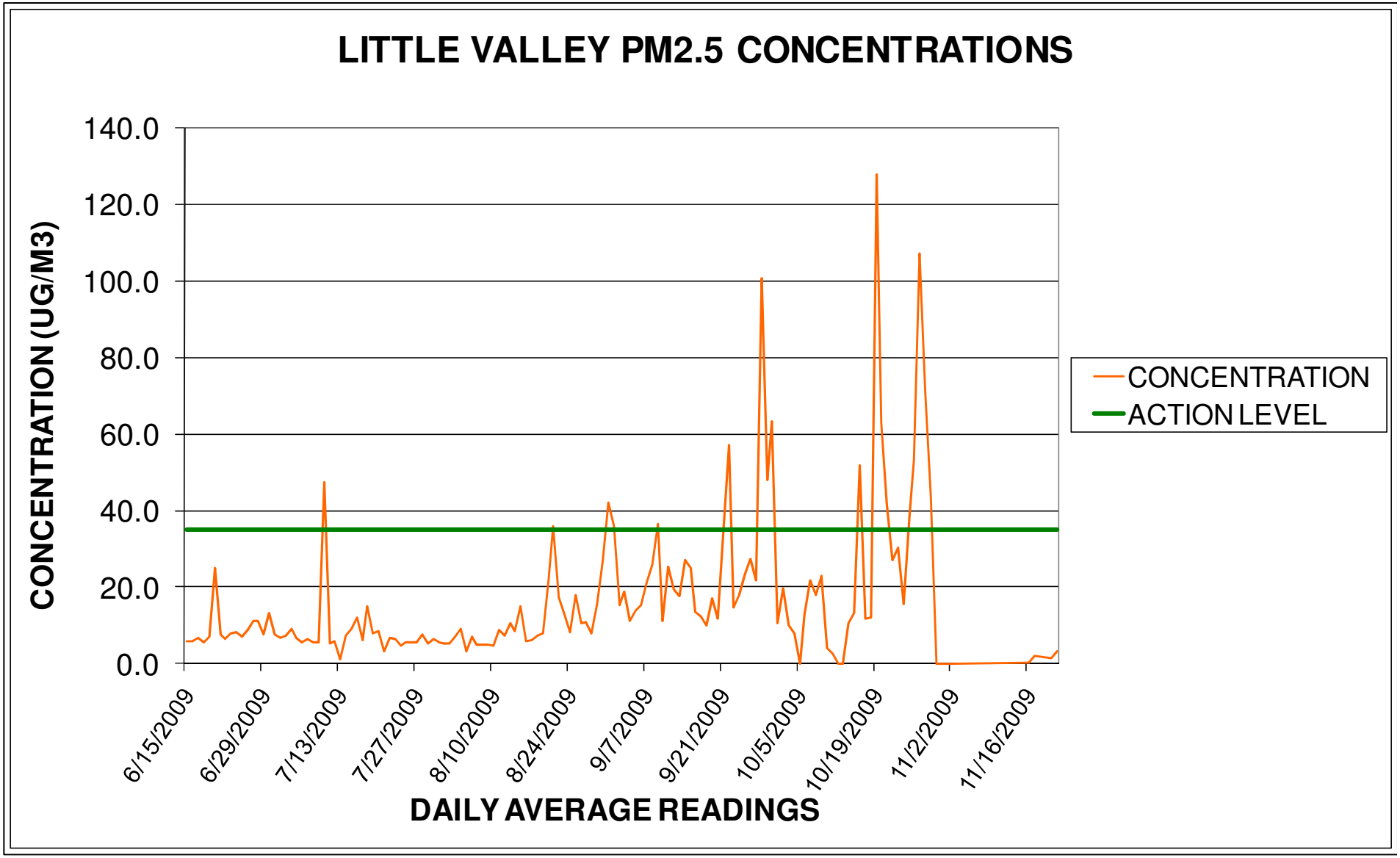
PM: Key Data on Short-Term Effects

The National Morbidity, Mortality and Air Pollution Study

90 Largest Cities in the US

- Daily changes in PM, mortality, weather
- Relatively consistent increase in Mortality:
  - 2% per 100 ug/m^3 of PM_{10}
- Smaller results than previous U.S. analyses
- Remain significant
- Not sensitive to inclusion of other pollutants
- Results different in different regions require additional analysis




LITTLE VALLEY PM2.5 CONCENTRATIONS
CONCENTRATION (UG/M3)
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
6/15/2009
6/29/2009
7/13/2009
7/27/2009
8/10/2009
8/24/2009
9/7/2009
9/21/2009
10/5/2009
10/19/2009
11/2/2009
11/16/2009
DAILY AVERAGE READINGS
CONCENTRATION
ACTION LEVEL

PM 2.5, 10 measurements

- Few controls to reduce exposure:
  - Reduce dust
  - Reduce exposure time during dust storms
- Personal protective equipment impractical
- Administrative controls: Move !

Unresolved Problems in Characterizing Health Effects of Ambient Air Pollution

- lack of demonstrated biological mechanisms for PM-related effects,
- potential influence of measurement error and exposure error,
- potential confounding by copollutants,
- evaluation of the effects of components, surface coatings or other characteristics of PM,
- the shape of concentration-response relationships,
- methodological uncertainties in epidemiological analyses,
- the extent of life span shortening,
- characterization of annual and daily background concentrations,
- understanding of the effects of coarse fraction PM, and
- effects, if any, of air toxics.

Public Health Significance

In US, EPA estimates on order of 10,000 particle-attributable deaths per year if cohort relative risks represent a causal effect

Smoking – 400,000 smoking attributable deaths per year

2. Co-pollutants

Recent Testimony on the EPA Proposed Decision on Particulate Matter

Suresh H. Moolgavkar, M.D., Ph.D.

Member, Fred Hutchinson Cancer Research Center; Professor of Epidemiology and Biostatistics, University of Washington - Leading Industry Consultant

"the potential for uncontrolled confounding by co-pollutants currently preclude the conclusion that the particulate component of air pollution is causally associated with adverse effects on human health."

Testimony on the EPA Proposed Decision on Particulate Matter

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Professor of Epidemiology and Biostatistics, University of Washington
Industry Consultant

"The proposed new regulations for particulate matter are based on the assumption that the magnitude of the associations between these pollutants and adverse human health effects reported in some epidemiologic studies is predictive of the gains in human health that would accrue by lowering ambient concentrations. **The evidence simply does not support this assumption**. Briefly, the dearth of toxicological information, the absence of biological understanding of underlying mechanism, and the potential for uncontrolled confounding by co-pollutants currently preclude the conclusion that the particulate component of air pollution is causally associated with adverse effects on human health."